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[Continued on next page]

(54) Title: IMAGE SENSING DEVICE, IMAGE EDIT METHOD, AND STORAGE MEDIUM FOR RECORDING IMAGE EDIT METHOD
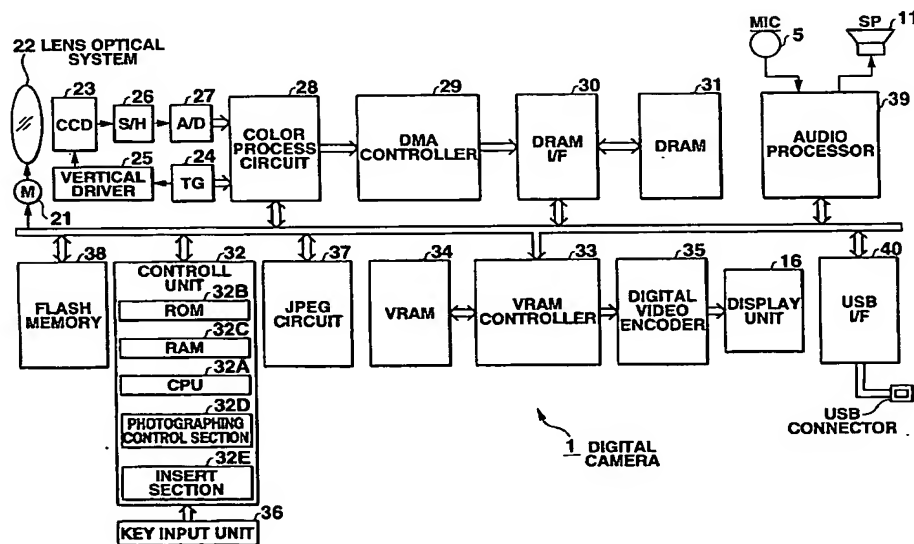
(57) Abstract: An image sensing device that can photograph and play back a moving image simplifies and executes an edit operation for forming one moving image by inserting another image in the middle of a given moving image. A device includes a flash memory (38) which records moving image data, a key input unit (36) which designates an arbitrary time position in the moving image data recorded in the flash memory (38), and a control unit (32) which starts photographing of an image on the basis of designation of the time position, inserts image data obtained by photographing in the moving image data on the basis of the designated time position, and plays back the obtained moving image data.

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DESCRIPTION

IMAGE SENSING DEVICE, IMAGE EDIT METHOD, AND
STORAGE MEDIUM FOR RECORDING IMAGE EDIT METHOD

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Technical Field

The present invention relates to an image sensing device that can record and play back a moving image, an image edit method, and a storage medium that records

10   the image edit method.

Background Art

In recent years, digital still cameras (to be simply referred to as "digital cameras" hereinafter) that can record image data obtained by photographing in

15   semiconductor memories have prevailed beyond conventional cameras that record images on silver halide films.

Most models of digital cameras of this type can photograph not only still images but also time-series

20   images, such as continuous-shot images, moving images, and the like although they cannot make long-time recording compared to camera-integrated video recorders in terms of the capacity of the recording media.

When a moving image is photographed by such

25   a digital camera, individual moving image data recorded on a memory card or the like as a recording medium are independent from each other. Hence, it is difficult to make an operation for, e.g., combining two moving

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images into one moving image using the digital camera.
In such case, edit software on a personal computer is
required.

Under such circumstances, a digital camera which
5   allows simple edit operations such as partial erase,
divide, join, and the like of moving images by
itself has been proposed. (For example, see patent
reference 1.)

[Patent Reference 1]

10   Jpn. Pat. Appln. KOKAI Publication No. 11-275512

As described above, a digital camera of patent
reference 1 allows the user to designate an edit point
in a moving image, and to make edit operations for
partially erasing, dividing, and joining a moving image
15   with reference to the designated edit point.

Upon inserting another moving image B in the
middle of given moving image A, which has already been
recorded by this digital camera, the following
operations are required:

20   (1)   designating an edit point in moving image A;
(2)   dividing moving image A into A1 and A2 by
edit mode "scissors";
(3)   joining moving images A1 and B by edit mode
"glue"; and
25   (4)   joining moving images "A1+B" and A2 by edit
mode "glue".

In addition, after the respective edit operations

such as divide, join, and the like, the edited moving

images are immediately saved by overwriting in a flash

memory as a recording medium. Therefore, when the user

confirms edited moving image "A1+B+A2" by selecting

5   a play mode, and is not satisfied with the contents, he

or she must re-do operations from those for dividing

joined moving image "A1+B+A2" into three moving images

by designating two edit points.

In this way, instructions for a plurality of

10   moving images must be issued by combining basic edit

operations. Therefore, troublesome operations are

required as a whole, and re-doing also requires similar

labor.

Disclosure of Invention

15   According to the present invention, an image

sensing device is characterized by comprising

a recording unit which records moving image data

obtained by photographing, a designation unit

which designates an arbitrary time position in the

20   moving image data recorded in the recording unit,

a photographing control unit which starts photographing

of an image on the basis of designation of the time

position by the designation unit, and an insert unit

which inserts image data obtained by photographing by

25   the photographing control unit in the moving image data

on the basis of the designated time position, and

stores the obtained moving image data.

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Brief Description of Drawings

FIGS. 1A and 1B illustrate a perspective view showing the outer appearance of a digital camera according to the first embodiment of the present

5   invention;

FIG. 2 is a block diagram showing the circuit arrangement according to the first embodiment;

FIG. 3 is a flow chart showing the processing contents mainly in a moving image insert mode according

10   to the first embodiment;

FIGS. 4A through 4E show examples of the edit contents of moving image data to be processed in the moving image insert mode according to the first embodiment;

15   FIG. 5 is a flow chart showing the processing contents mainly in a moving image insert mode according to the second embodiment of the present invention;

FIGS. 6A through 6G show examples of the edit contents of moving image data to be processed in the

20   moving image insert mode according to the second embodiment;

FIG. 7 is a flow chart showing the processing contents mainly in a moving image insert mode according to the third embodiment of the present invention;

25   FIG. 8A through 8G show examples of the edit contents of moving image data to be processed in the moving image insert mode according to the third

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embodiment;

FIG. 9 is a flow chart showing the processing contents mainly in a moving image insert mode according to the fourth embodiment of the present invention;

5   FIG. 10 shows a display example upon playing back moving image data in the moving image insert mode according to the first embodiment of the present invention; and

FIG. 11 shows a display example when a play mode
10   in the moving image insert mode according to the first embodiment is switched to a record mode.

Best Mode for Carrying Out the Invention
(First Embodiment)

The first embodiment upon applying the present
15   invention to a digital camera will be described hereinafter with reference to the accompanying drawings.

FIGS. 1A and 1B show the outer appearance of the digital camera. FIG. 1A is a perspective view mainly showing the front side of the digital camera, and
20   FIG. 1B is a perspective view mainly showing the back side of it.

This digital camera 1 has a photographing lens 2, self timer lamp 3, optical viewfinder window 4, microphone 5, strobe emission unit 6, and rubber
25   grip 7, which are arranged on the front surface of a substantially rectangular, low-profile body. On the right end side of the top surface (with respect to the

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user), a power key 8 and shutter key 9 are arranged.

The rubber grip 7 is a rubber, strip-shaped projection, which is arranged so that the second finger, third finger, and little finger of the right

5   hand of the user can firmly hold a housing when he or she holds the digital camera 1 with the right hand from the right side surface side of the housing upon photographing.

The power key 8 is operated to turn on/off a power

10   supply. The shutter key 9 is used to instruct photographing in a photographing mode. The shutter key 9 also serves as an execution key used to instruct setting/execution in, e.g., menu selection.

On the back surface of the digital camera 1,

15   a mode switch (SW) 10, loudspeaker 11, menu key 12, cross key 13, optical viewfinder 14, strobe charge lamp 15, and display unit 16 are arranged.

The mode switch 10 comprises, e.g., a slide switch, and is used to switch between a record mode "R"

20   and play mode "P" as basic modes.

The menu key 12 is operated upon selecting various menu items and the like.

The cross key 13 is formed by integrating cursor keys in the up, down, right, and left directions.

25   The display unit 16 comprises a color liquid crystal panel with a backlight. The display unit 16 displays a monitored through image as an electronic

viewfinder in the record mode. Also, the display
unit 16 displays a selected image played back in the
play mode.

Assume that a memory card slot for detachably
5   receiving a memory card used as a recording medium,
a USB (Universal Serial Bus) connector as an example of
a serial interface connector used to connect
an external personal computer, and the like are
provided on the bottom surface of the digital camera 1
10   (although none of them are shown).

The digital circuit arrangement of the digital
camera 1 will be explained below using FIG. 2.

In a monitoring state in an image photographing
mode, a focusing position and aperture position are
15   moved by driving a motor (M) 21. A CCD 23 is an image
sensing element which is arranged behind the
photographing optical axis of a lens optical system 22
including the photographing lens 2. The CCD 23 is
scanned and driven by a timing generator (TG) 24 and
20   vertical driver 25, and outputs a photoelectric
conversion output corresponding to a formed optical
image for one frame at predetermined cycles.

This photoelectric conversion output appropriately
undergoes gain adjustment for respective primary color
25   components (RGB) as analog value signals, and is then
sampled/held by a sample/hold circuit (S/H) 26. The
output from the sample/hold circuit 26 is converted

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into digital data by an A/D converter 27. The digital
data undergoes color processes including a pixel
interpolation process and γ correction process by a
color process circuit 28 to generate a luminance signal
5   Y and color difference signals Cb and Cr of digital
values. These signals are then output to a DMA (Direct
Memory Access) controller 29.

The DMA controller 29 temporarily writes the
luminance signal Y and color difference signals Cb and
10   Cr output from the color process circuit 28 in its
internal memory using a composite sync signal, memory
write enable signal, and clock signal, which are also
output from the color process circuit 28. The DMA
controller 29 then DMA-transfers these signals to
15   a DRAM 31 used as a buffer memory via a DRAM interface
(I/F) 30.

A control unit 32 comprises a CPU 32A, a ROM 32B
which permanently stores an operation program, a RAM
32C which is used as a work memory, a photographing
20   control section 32D which starts photographing of an
image, and an insert section 32E which inserts moving
image data in another moving image data and stores
them. The control unit 32 controls the operation of
the overall digital camera 1. After the luminance and
25   color difference signals are DMA-transferred to the
DRAM 31, the control unit 32 reads out these luminance
and color difference signals from the DRAM 31 via the

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DRAM interface 30, and writes them in a VRAM 34 via
a VRAM controller 33.

A digital video encoder 35 periodically reads out
the luminance and color difference signals from the
VRAM 34 via the VRAM controller 33, generates a video
signal based on these data, and outputs the video
signal to the display unit 16.

The display unit 16 serves as a monitor display
unit (electronic viewfinder) in the image photographing
mode, as described above. The display unit 16 makes
a display based on the video signal from the digital
video encoder 35, thus displaying an image based on
image information captured from the VRAM controller 33
at that time in real time.

When the user operates the shutter key 9 that
forms a key input unit 36 (designation unit) at
a timing at which he or she wants to photograph a still
image, while an image at that time is displayed in this
way on the display unit 16 as a monitor image in real
time, a trigger signal is generated.

In response to this trigger signal, the control
unit 32 closes a route from the CCD 23 to the DRAM 31
immediately after completion of DMA transfer of the
luminance and color difference signals for one frame,
which are captured from the CCD 23 at that time, to
the DRAM 31, and shifts to a record/save state.

In the record/save state, the control unit 32

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reads out the luminance and color difference signals

for one frame, which are written in the DRAM 31, for

respective units called basic blocks (8 pixels

(vertical direction) × 8 pixels (horizontal direction))

5   of each of Y, Cb, and Cr component data, and writes the

readout signals in a JPEG (Joint Photographic Experts

Group) circuit 37. The JPEG circuit 37 compresses data

by processes such as ADCT (Adaptive Discrete Cosine

Transform), Huffman encoding as entropy encoding, and

10   the like.

The control unit 32 reads out the obtained encoded

data from the JPEG circuit 37 as a data file of one

image, and writes it in a flash memory 38 (recording

unit) as a nonvolatile memory. The flash memory 38 is

15   sealed in a memory card which is detachably attached as

a recording medium of this digital camera 1.

Furthermore, this flash memory 38 may be

incorporated in the digital camera 1 in addition to the

detachable memory card, and both the memory card and

20   internal memory may be used together.

Upon completion of the compression process of the

luminance and color difference signals for one frame,

and the write process of all compressed data in the

flash memory 38, the control unit 32 opens the route

25   from CCD 32 to the DRAM 31 again.

The control unit 32 is further connected with

an audio processor 39 and USB interface (I/F) 40.

The audio processor 39 comprises a sound source circuit such as a PCM sound source or the like. In an audio recording mode, the audio processor 39 converts an audio signal input from the microphone (MIC) 5 into digital data. The audio processor 39 compresses that data according to a predetermined data file format, e.g., MP3 (MPEG-1 audio layer 3) to generate an audio data file, and sends that file to the control unit 32. On the other hand, in an audio play mode, the audio processor 39 decompresses the received audio data file and converts the decompressed data into an analog signal. The audio processor 39 then drives the loudspeaker (SP) 11 to produce a sound aloud.

The USB interface 40 makes communication control upon exchanging image data and the like with an external device (e.g., a personal computer) which is wired-connected via a USB connector 41.

Note that the key input unit 36 includes the power key 8, mode switch 10, menu key 12, cross key 13, and the like in addition to the shutter key 9. Signals generated upon operations of these keys are directly output to the control unit 32.

Upon photographing a moving image in place of a still image, still image data files which are obtained by compressing the still image data by the JPEG circuit 37 are temporally continuously recorded while the shutter key 9 of the key input unit 36 is

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kept operated.   Upon completion of the operation of
the shutter key 9 or after an elapse of a predetermined
limit time (e.g., 30 seconds), a series of still image
data files are re-set as a motion JPEG data file.

5   In a play mode, the control unit 32 selectively
reads out image data recorded in the flash memory 38.
The JPEG circuit 37 expands the compressed image data
in a sequence opposite to the data compression sequence
in the photographing mode.   After the expanded image
10   data is held in the DRAM 31 via the DRAM interface 30,
the held contents of the DRAM 31 are stored in the VRAM
34 via the VRAM controller 33.   The image data is then
periodically read out from the VRAM 34 to generate
a video signal, which is played back and output onto
15   the display unit 16.

          When the selected image data is not a still image
but a moving image, individual still image data which
form the selected moving image file are temporally
continuously played back.   Upon completion of playback
20   of all still image data, only still image data located
at the head of the moving image file is played back and
displayed until the next play instruction is issued.

          The operation of this embodiment will be explained
below.

25   FIG. 3 shows a series of processing contents
executed mainly by the control unit 32 until moving
image data recorded in the flash memory 38 is selected,

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another moving image data is inserted in the selected

moving image data, and the obtained data is recorded to

update old data, while the play mode is selected by the

mode switch 10.

5   At the beginning of this process, after moving

image data to be displayed is selected (step A01), the

control waits for one of the following key operations

by repetitively checking whether or not the user has

made a key operation that instructs play start by

10   directly operating the shutter key 9 (step A02), or

whether or not the user has designated a moving image

insert mode for inserting another moving image in the

middle of the selected moving image by operating the

shutter key 9 after the operations of the menu key 12

15   and cross key 13 (step A03).

When the user has made the key operation

associated with designation of the moving image insert

mode, that operation is detected in step A03, and the

moving image insert mode is set (step A04). The flow

20   then returns to the process from step A01.

If it is determined in step A02 that the user has

made the key operation for starting playback, it is

determined whether or not the moving image insert mode

is set at that time (step A05).

25   If the moving image insert mode is not set, it is

determined that a normal moving image playback process

is to be executed, and a description thereof will be

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omitted.

If it is determined in step A05 that the moving image insert mode is set, the moving image data selected in step A01 begins to be played back (step A06). After that, the control waits for one of the following states by repetitively checking whether or not the user has given an insert mark that designates an insert timing in the middle of the moving image, whose playback and display are in progress, by operating, e.g., the shutter key 9 (step A07), and whether or not the playback process of the initially selected moving image is complete (step A08). FIG. 10 shows a display example on the display unit 16 in steps A06 and A07, i.e., a state wherein the user has given insert mark M that designates an insert timing during playback and display of the moving image data selected in step A01. A bar displayed below the moving image indicates the whole moving image data, whose playback and display are in progress, by BAR, and also the ratio of data played back so far of the whole data by BAR1.

If it is determined in step A08 that the playback process of the moving image is complete, it is determined that no insert mark is given, and the initially selected moving image consequently has no time position to be edited (inserted), thus ending a series of processes.

If it is determined in step A07 that the insert

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mark has been given, the control immediately transits

from the play mode as the basic mode to the record mode

(step A09), and waits for a key operation that

instructs the start of recording a new moving image to

5   be inserted (more specifically, the operation of the

shutter key 9) (step A10).

        In this case, the display unit 16 may also display

a guide message as a character string:

        "Press shutter to start photographing moving image

10   to be inserted"

FIG. 11 shows a display example of the guide message

superimposed on a through image displayed on the

display unit 16 after the control has entered the

record mode in step A09.

15   When the user has issued a recording start

instruction of a moving image by operating the shutter

key 9, that operation is detected in step A10. Then,

the moving image to be inserted is recorded (step A11)

while repeating a process for determining the end of

20   recording of the moving image by checking whether the

shutter key 9 is released or a predetermined limit time

of moving image continuous recording (e.g., 30 seconds)

has elapsed (step A12).

        At this time, the obtained moving image data is

25   sequentially recorded in the flash memory 38 as new

moving image data.

        If the end of recording of the moving image is

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determined in step A12, it is determined that the
moving image data to be inserted has been acquired.
Hence, the record mode is switched to the play mode
again (step A13) to play back and display, on the
5   display unit 16, moving image data obtained by
inserting the new moving image data acquired by
recording in the middle of the moving image data
selected in step A01, from the beginning to the end
(step A14).

10   Upon completion of the playback process, it is
checked whether or not the played contents are recorded
and saved as a new moving image data file (step A15).
       This checking process is made by displaying, on
the display unit 16, a guide message as a character
15   string:
            "Do you want to record contents played back now as
new file?
            YES   NO"
and by determining whether the user directly operates
20   the shutter key 9 while a character string part "YES"
is highlighted by a cursor, or operates the shutter key
9 after he or she moves the highlight of the cursor to
a character string part "NO" by operating the right key
of the cross key 13.

25   If it is determined in step A15 that the obtained
data is to be recorded and saved as a new file, the
edit process is executed using the two moving image

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data recorded in the flash memory 38 to obtain the

above playback order, and the edited moving image data

is newly recorded as one moving image data (step A16),

thus ending a series of processes.

5   On the other hand, if it is determined in step A15

that the obtained data is not to be recorded and saved

as a new file, the moving image data to be inserted

acquired by photographing is deleted by erasing it from

the flash memory 38 (step A17), thus ending a series of

10   processes.

FIGS. 4A through 4E show examples of moving image

data to be edited based on the series of processes

mentioned above. Assume that moving image A shown in

FIG. 4A is initially selected in step A01.

15   Also, assume that this moving image A is played

back while setting the moving image insert mode, and

insert mark IM is given at a playback timing shown in

FIG. 4B. Let A1 be the former half of moving image A

that has already been played back, and A2 be the latter

20   half of moving image A to be played back.

The record mode starts automatically, and moving

image B to be inserted is newly recorded by the

processes in steps A10 to A12, as shown in FIG. 4C.

The play mode starts automatically in step A13, and the

25   display unit 16 plays back and displays a series of

moving images "A1+B+A2" obtained by inserting moving

image ·B at the insert mark IM given position in moving

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image A, as shown in FIG. 4D, in step A14.

When the user has made the key operation that
instructs to record and save, as a new moving image,
played moving image A, in which moving image B is
5   inserted at an arbitrary time position, new moving
image A' is recorded in the flash memory 38 in step A16
to update old data, as shown in FIG. 4E. At the same
time, the data files of old moving images A and B are
erased from the flash memory 38 for the purpose of
10   arrangement.

In this way, a series of edit processes required
when an arbitrary time position is designated in an
initially selected moving image (A), a new moving image
(B) to be inserted is photographed, and a moving image
15   (A1+B+A2) obtained by inserting the moving image (B)
into the selected moving image (A) is played back and
displayed can be executed by minimum required key
operations without any change operations of the basic
modes. Hence, the operations required for the user of
20   the digital camera 1 to edit data can be greatly
simplified.

In addition, after the user temporarily confirms
the contents (A1+B+A2) obtained by inserting the moving
image (B) to be inserted acquired by photographing, the
25   obtained contents are recorded in the flash memory 38
as a recording medium. Therefore, when the user is not
satisfied with the edited contents, the edited contents

are not recorded, and the moving image (B) photographed

aftertime is automatically deleted from the flash

memory 38. Therefore, processes required until the

user can re-do similar edit operations can be greatly

5   reduced.

(Second Embodiment)

       The second embodiment upon applying the present

invention to a digital camera will be described

hereinafter with reference to the accompanying

10   drawings.

       Note that the outer appearance and digital circuit

arrangement of the digital camera are basically the

same as those shown in FIGS. 1A, 1B and 2. Hence, the

same reference numerals in this embodiment denote the

15   same parts as in the first embodiment, and an

illustration and description thereof will be omitted.

       The operation of this embodiment will be described

below.

       FIG. 5 shows a series of processing contents

20   executed mainly by the control unit 32 until moving

image data recorded in the flash memory 38 is selected,

another moving image data is inserted in the selected

moving image data, and the obtained data is recorded to

update old data, while the play mode is selected by the

25   mode switch 10.

       At the beginning of this process, after moving

image data to be displayed is selected (step B01), the

control waits for one of the following key operations
by repetitively checking whether or not the user has
made a key operation that instructs play start by
directly operating the shutter key 9 (step B02), or
5   whether or not the user has designated a moving image
insert mode for inserting another moving image in the
middle of the selected moving image by operating the
shutter key 9 after the operations of the menu key 12
and cross key 13 (step B03).

10   When the user has made the key operation
associated with designation of the moving image insert
mode, that operation is detected in step B03, and the
moving image insert mode is set (step B04). The flow
then returns to the process from step B01.

15   If it is determined in step B02 that the user has
made the key operation for starting playback, it is
determined whether or not the moving image insert mode
is set at that time (step B05).

            If the moving image insert mode is not set, it is
20   determined that a normal moving image playback process
is to be executed, and a description thereof will be
omitted.

            If it is determined in step B05 that the moving
image insert mode is set, the moving image data
25   selected in step B01 begins to be played back
(step B06). After that, the control waits for one of
the following states by repetitively checking whether

or not the playback process of the selected moving
image is complete (step B07), whether or not the user
has given an insert mark that designates an insert
timing in the middle of the moving image, whose

5   playback and display are in progress, by operating,
e.g., the shutter key 9 (step B08), and whether or not
the user ends the giving operation of the insert mark
by operating, e.g., the right key of the cross key 13
(step B09).

10   If it is determined in step B08 that the user has
given the insert mark, it is determined that the insert
mark is to be given in correspondence with that time
position, and the control unit 32 internally stores
a setup of the given insert mark (step B10). The flow

15   then returns to the process from step B09.
If it is determined in step B07 that the playback
process of the selected moving image is complete or if
it is determined in step B09 that the giving operation
of the insert mark is to end, whether or not a moving

20   image to be inserted in the selected moving image
remains is determined by checking if the control
unit 32 internally stores the setup of the given insert
mark (step B11).
If it is determined that the moving image to be

25   inserted remains, the control immediately transits from
the play mode as the basic mode to the record mode
(step B12), and waits for a key operation that

instructs the start of recording a new moving image to be inserted (more specifically, the operation of the shutter key 9) (step B13).

In this case, the display unit 16 may also display a guide message as a character string:

"Press shutter to start photographing moving image to be inserted"

When the user has issued a recording start instruction of a moving image by operating the shutter key 9, that operation is detected in step B13. Then, the moving image to be inserted is recorded (step B14) while repeating a process for determining the end of recording of the moving image by checking whether the shutter key 9 is released or a predetermined limit time of moving image continuous recording (e.g., 30 seconds) has elapsed (step B15).

At this time, the obtained moving image data is sequentially recorded in the flash memory 38 as new moving image data.

If the end of recording of the moving image is determined in step B15, the setup of the given insert mark internally stored in the control unit 32 is checked by appending flag information indicating that the corresponding moving image has already been recorded (step B16). The flow then returns to step B11 to check if other moving images to be inserted still remain.

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When a plurality of insert marks are given and set
in step B10 and moving images are to be inserted at a
plurality of positions in the initially selected moving
image, the processes in steps B11 to B16 are repeated
5   in correspondence with the number of insert marks, and
moving images to be inserted are recorded in turn.

Upon completion of photographing and recording of
all moving images to be recorded, it is determined in
step B11 that no moving image to be inserted remains,
10   and the record mode is switched to the play mode again
(step B17). Then, the display unit 16 plays back and
displays moving image data in which a plurality of new
moving image data acquired by recording are inserted in
the middle of the moving image data selected in step
15   B01 from the beginning to the end (step B18).

Upon completion of the playback process, it is
checked whether or not the played contents are recorded
and saved as a new moving image data file (step B19).

This checking process is made by displaying, on
20   the display unit 16, a guide message as a character
string:

"Do you want to record contents played back now as
new file?

YES   NO"
25   and by determining whether the user directly operates
the shutter key 9 while a character string part "YES"
is highlighted by a cursor, or operates the shutter key

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9 after he or she moves the highlight of the cursor to
a character string part "NO" by operating the right key
of the cross key 13.

If it is determined in step B19 that the obtained
data is to be recorded and saved as a new file, the
edit process is executed using the respective moving
image data recorded in the flash memory 38 to obtain
the above playback order, and the edited moving image
data is newly recorded as one moving image data
(step B20), thus ending a series of processes.

On the other hand, if it is determined in step B19
that the obtained data is not to be recorded and saved
as a new file, respective moving image data to be
inserted acquired by photographing are deleted by
simultaneously erasing them from the flash memory 38
(step B21), thus ending a series of processes.

FIGS. 6A through 6G show examples of moving image
data to be edited based on the series of processes
mentioned above. Assume that moving image A shown in
FIG. 6A is initially selected in step B01.

Also, assume that this moving image A is played
back while setting the moving image insert mode, and
insert marks IM1 to IM3 are given at respective
playback timings shown in FIG. 6B. Then, this moving
image A is divided into partial images A1 to A4 at the
positions of insert marks IM1 to IM3 given in this way.

The record mode starts automatically, and moving

images B to D to be inserted are newly recorded in turn
by the processes in steps B13 to B16, as shown in
FIGS. 6C to 6E. Then, after it is determined in
step B11 that the recording processes of required

5   moving images to be inserted are complete, the play
mode starts automatically in step B17.

In step B18, the display unit 16 plays back and
displays a series of moving images "A1+B+A2+C+A3+D+A4"
obtained by inserting moving images B, C, and D at the

10   given positions of insert marks IM1 to IM3 in moving
image A, as shown in FIG. 6F.

When the user has made the key operation that
instructs to record and save, as a new moving image,
played moving image A, in which moving images B to D

15   are inserted at arbitrary time positions, new moving
image A' is recorded in the flash memory 38 in step B20
to update old data, as shown in FIG. 6G. At the same
time, the data files of old moving image A and moving
images B to D to be inserted acquired by photographing

20   are erased from the flash memory 38 for the purpose of
arrangement.

In this way, a series of edit processes required
when a plurality of arbitrary time positions are
designated in an initially selected moving image (A),

25   new moving images (B to D) to be inserted are
photographed in turn, and a moving image
(A1+B+A2+C+A3+D+A4) obtained by inserting these

moving images into the selected moving image (A) is
played back and displayed can be executed by minimum
required key operations without any change operations
of the basic modes. Hence, the operations required for
5   the user of the digital camera 1 to edit data can be
greatly simplified.

In addition, since a plurality of moving images
are inserted in the initially selected moving image,
for example, a flashback-like video effect can be
10   easily set and executed, thus widening the range of
expression.
(Third Embodiment)

The third embodiment upon applying the present
invention to a digital camera will be described
15   hereinafter with reference to the accompanying
drawings.

Note that the outer appearance and digital circuit
arrangement of the digital camera are basically the
same as those shown in FIGS. 1A, 1B and 2. Hence, the
20   same reference numerals in this embodiment denote the
same parts as in the first embodiment, and an
illustration and description thereof will be omitted.

The operation of this embodiment will be described
below.
25   FIG. 7 shows a series of processing contents
executed mainly by the control unit 32 until moving
image data recorded in the flash memory 38 is selected,

another moving image data is inserted in the selected
moving image data, and the obtained data is recorded to
update old data, while the play mode is selected by the
mode switch 10.

5   At the beginning of this process, after moving
image data to be displayed is selected (step C01), the
control waits for one of the following key operations
by repetitively checking whether or not the user has
made a key operation that instructs play start by
10   directly operating the shutter key 9 (step C02), or
whether or not the user has designated a moving image
insert mode for inserting another moving image in the
middle of the selected moving image by operating the
shutter key 9 after the operations of the menu key 12
15   and cross key 13 (step C03).

When the user has made the key operation
associated with designation of the moving image insert
mode, that operation is detected in step C03, and the
moving image insert mode is set (step C04). The flow
20   then returns to the process from step C01.

If it is determined in step C02 that the user has
made the key operation for starting playback, it is
determined whether or not the moving image insert mode
is set at that time (step C05).

25   If the moving image insert mode is not set, it is
determined that a normal moving image playback process
is to be executed, and a description thereof will be

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omitted.

If it is determined in step C05 that the moving image insert mode is set, the moving image data selected in step C01 begins to be played back (step C06). After that, the control waits for one of the following states by repetitively checking whether or not the playback process of the selected moving image is complete (step C07), whether or not the user has given an insert mark that designates an insert timing in the middle of the moving image, whose playback and display are in progress, by operating, e.g., the shutter key 9 (step C08), and whether or not the user ends the giving operation of the insert mark by operating, e.g., the right key of the cross key 13 (step C09).

If it is determined in step C08 that the user has given the insert mark, it is determined that the insert mark is to be given in correspondence with that time position, and the control unit 32 internally stores a setup of the given insert mark (step C10). At the same time, the control unit 32 stores a setup of the photographing order of that insert mark (step C11). The flow then returns to the process from step C09.

If it is determined in step C07 that the playback process of the selected moving image is complete or if it is determined in step C09 that the giving operation of the insert mark is to end, whether or not a moving

image to be inserted in the selected moving image

remains is determined by seeing if the control unit 32

internally stores the setup of the given insert mark

(step C12).

5   If it is determined that the moving image to be

inserted remains, the control immediately transits from

the play mode as the basic mode to the record mode

(step C13). After the first position of those of

moving images to be inserted in the photographing order

10   is designated (step C14), the control waits for a key

operation that instructs the start of recording a new

moving image to be inserted (more specifically, the

operation of the shutter key 9) (step C15).

In this case, the display unit 16 may also display

15   a guide message as a character string:

"Press shutter to start photographing moving image

to be inserted"

When the user has issued a recording start

instruction of a moving image by operating the shutter

20   key 9, that operation is detected in step C15. Then,

the moving image to be inserted is recorded (step C16)

while repeating a process for determining the end of

recording of the moving image by checking whether the

shutter key 9 is released or a predetermined limit time

25   of moving image continuous recording (e.g., 30 seconds)

has elapsed (step C17).

At this time, the obtained moving image data is

sequentially recorded in the flash memory 38 as new moving image data.

If the end of recording of the moving image is determined in step C17, the setup of the given insert mark internally stored in the control unit 32 is checked by appending flag information indicating that the corresponding moving image has already been recorded (step C18). The flow then returns to step C12 to check if other moving images to be inserted still remain.

When a plurality of insert marks are given and set in steps C10 and C11 and moving images are to be inserted at a plurality of positions in the initially selected moving image, the processes in steps C12 to B18 are repeated in correspondence with the number of insert marks, and moving images to be inserted are recorded in turn in accordance with the designated photographing order.

Upon completion of photographing and recording of all moving images to be recorded, it is determined in step C12 that no moving image to be inserted remains, and the record mode is switched to the play mode again (step C19). Then, the display unit 16 plays back and displays moving image data in which a plurality of new moving image data acquired by recording in the designated photographing order are inserted in the middle of the moving image data selected in step C01

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from the beginning to the end (step C20).

Upon completion of the playback process, it is
checked whether or not the played contents are recorded
and saved as a new moving image data file (step C21).

5   This checking process is made by displaying, on
the display unit 16, a guide message as a character
string:

"Do you want to record contents played back now as
new file?

10   YES   NO"
and by determining whether the user directly operates
the shutter key 9 while a character string part "YES"
is highlighted by a cursor, or operates the shutter
key 9 after he or she moves the highlight of the cursor

15   to a character string part "NO" by operating the right
key of the cross key 13.

If it is determined in step C21 that the obtained
data is to be recorded and saved as a new file, the
edit process is executed using the respective moving

20   image data recorded in the flash memory 38 to obtain
the above playback order, and the edited moving image
data is newly recorded as one moving image data
(step C22), thus ending a series of processes.

On the other hand, if it is determined in step C21

25   that the obtained data is not to be recorded and saved
as a new file, respective moving image data to be
inserted acquired by photographing are deleted by

simultaneously erasing them from the flash memory 38 (step C23), thus ending a series of processes.

FIGS. 8A through 8G show examples of moving image data to be edited based on the series of processes mentioned above. Assume that moving image A shown in FIG. 8A is initially selected in step C01.

Also, assume that this moving image A is played back while setting the moving image insert mode, and insert marks IM1 to IM3 are given at a total of three positions at playback timings shown in FIG. 8B. In this case, the photographing order of moving images to be inserted is designated at the same time. Then, this moving image A is divided into partial images A1 to A4 at the positions of insert marks IM1 to IM3 designated in this way.

The record mode starts automatically, and moving images B to D to be inserted are newly recorded in turn by the processes in steps C15 to C18, as shown in FIGS. 8C to 8E. Then, after it is determined in step C12 that the recording processes of required moving images to be inserted are complete, the play mode starts automatically in step C19.

In step C20, the display unit 16 plays back and displays a series of moving images "A1+C+A2+D+A3+B+A4" obtained by inserting moving images B, C, and D at the given positions of insert marks IM1 to IM3 in moving image A in accordance with the designated photographing

order, as shown in FIG. 8F.

When the user has made the key operation that
instructs to record and save, as a new moving image,
played moving image A, in which moving images B to D
5   are inserted at arbitrary time positions in accordance
with the designated photographing order, new moving
image A' is recorded in the flash memory 38 in step C22
to update old data, as shown in FIG. 8G. At the same
time, the data files of old moving image A and moving
10   images B to D to be inserted acquired by photographing
are erased from the flash memory 38 for the purpose of
arrangement.

In this way, a series of edit processes required
when a plurality of arbitrary time positions are
15   designated in an initially selected moving image (A),
new moving images (B to D) to be inserted are
photographed in turn in accordance with the designated
order, and a moving image (A1+C+A2+D+A3+B+A4) obtained
by inserting these moving images into the selected
20   moving image (A) is played back and displayed can be
executed by minimum required key operations without any
change operations of the basic modes. Hence, the
operations required for the user of the digital
camera 1 to edit data can be greatly simplified.

25   In addition, since a plurality of moving images
are inserted in the initially selected moving image,
for example, a flashback-like video effect can be

easily set and executed, thus extending the range of expression.

Furthermore, since the photographing order of each individual moving image to be inserted in the middle of a given moving image can be designated, the labor required to photograph and edit images can be reduced, according to user's ingenuity, thus easily creating a richly expressive moving image.

(Fourth Embodiment)

The fourth embodiment upon applying the present invention to a digital camera will be described hereinafter with reference to the accompanying drawings.

Note that the outer appearance and digital circuit arrangement of the digital camera are basically the same as those shown in FIGS. 1A, 1B and 2. Hence, the same reference numerals in this embodiment denote the same parts as in the first embodiment, and an illustration and description thereof will be omitted.

The operation of this embodiment will be described below.

FIG. 9 shows a series of processing contents executed mainly by the control unit 32 until moving image data recorded in the flash memory 38 is selected, another moving image data is inserted in the selected moving image data, and the obtained data is recorded to update old data, while the play mode is selected by the

mode switch 10.

At the beginning of this process, after moving
image data to be displayed is selected (step D01), the
control waits for one of the following key operations

5   by repetitively checking whether or not the user has
made a key operation that instructs play start by
directly operating the shutter key 9 (step D02), or
whether or not the user has designated a moving image
insert mode for inserting another moving image in the

·10   middle of the selected moving image by operating the
shutter key 9 after the operations of the menu key 12
and cross key 13 (step D03).

When the user has made the key operation
associated with designation of the moving image insert

15   mode, that operation is detected in step D03, and the
moving image insert mode is set (step D04). The flow
then returns to the process from step D01.

If it is determined in step D02 that the user has
made the key operation for starting playback, it is

20   determined whether or not the moving image insert mode
is set at that time (step D05).

If the moving image insert mode is not set, it is
determined that a normal moving image playback process
is to be executed, and a description thereof will be

25   omitted.

If it is determined in step D05 that the moving
image insert mode is set, the moving image data

selected in step D01 begins to be played back

(step D06). After that, the control waits for one of

the following states by repetitively checking whether

or not the user has given an insert mark that

5   designates an insert timing in the middle of the moving

image, whose playback and display are in progress, by

operating, e.g., the shutter key 9 (step D07), and

whether or not the playback process of the initially

selected moving image is complete (step D08).

10   If it is determined in step D08 that the playback

process of the moving image is complete, it is

determined that no insert mark is given, and the

initially selected moving image consequently has no

time position to be edited (inserted), thus ending

15   a series of processes.

If it is determined in step D07 that the insert

mark has been given, the control immediately transits

from the play mode as the basic mode to the record mode

(step D09). In addition, the display unit 16 plays

20   back a moving image for a predetermined period of time

(e.g., 5 seconds) by tracing from the time position in

the moving image at which the insert mark is given and

set (step D10). The control then waits for a key

operation that instructs the start of recording a new

25   moving image to be inserted (more specifically,

the operation of the shutter key 9) (step D11).

In this case, the display unit 16 may also display

a guide message as a character string:

"Press shutter to start photographing moving image to be inserted"

When the user has issued a recording start instruction of a moving image by operating the shutter key 9, that operation is detected in step D11. Then, the moving image to be inserted is recorded (step D12) while repeating a process for determining the end of recording of the moving image by checking whether the shutter key 9 is released or a predetermined limit time of moving image continuous recording (e.g., 30 seconds) has elapsed (step D13).

At this time, the obtained moving image data is sequentially recorded in the flash memory 38 as new moving image data.

If the end of recording of the moving image is determined in step D13, it is determined that the moving image data to be inserted has been acquired. Hence, the record mode is switched to the play mode again (step D14) to play back and display, on the display unit 16, moving image data obtained by inserting the new moving image data acquired by recording in the middle of the moving image data selected in step D01, from the beginning to the end (step D15).

Upon completion of the playback process, it is checked whether or not the played contents are recorded

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and saved as a new moving image data file (step D16).

This checking process is made by displaying, on the display unit 16, a guide message as a character string:

"Do you want to record contents played back now as new file?

YES   NO"

and by determining whether the user directly operates the shutter key 9 while a character string part "YES" is highlighted by a cursor, or operates the shutter key 9 after he or she moves the highlight of the cursor to a character string part "NO" by operating the right key of the cross key 13.

If it is determined in step D16 that the obtained data is to be recorded and saved as a new file, the edit process is executed using the two moving image data recorded in the flash memory 38 to obtain the above playback order, and the edited moving image data is newly recorded as one moving image data (step D17), thus ending a series of processes.

On the other hand, if it is determined in step D16 that the obtained data is not to be recorded and saved as a new file, the moving image data to be inserted acquired by photographing is deleted by erasing it from the flash memory 38 (step D18), thus ending a series of processes.

FIGS. 4A through 4E above show an example of

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moving image data to be edited based on the series of processes mentioned above. Assume that moving image A shown in FIG. 4A is initially selected in step D01.

Also, assume that this moving image A is played back while setting the moving image insert mode, and insert mark IM is given at a playback timing shown in FIG. 4B. Let A1 be the former half of moving image A that has already been played back, and A2 be the latter half of moving image A to be played back.

The record mode starts automatically, and an image for a predetermined period of time from the timing at which insert mark IM is given is played back and displayed again in step D10 to make the user recognize well the image of a moving image to be inserted. After that, moving image B to be inserted is newly recorded by the processes in steps D11 to A13, as shown in FIG. 4C. The play mode starts automatically in step D14, and the display unit 16 plays back and displays a series of moving images "A1+B+A2" obtained by inserting moving image B at the insert mark IM given position in moving image A, as shown in FIG. 4D, in step D15.

When the user has made the key operation that instructs to record and save, as a new moving image, played moving image A, in which moving image B is inserted at an arbitrary time position, new moving image A' is recorded in the flash memory 38 in step D17

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to update old data, as shown in FIG. 4E. At the same
time, the data files of old moving images A and B are
erased from the flash memory 38 for the purpose of
arrangement.

5   In this way, a series of edit processes required
when an arbitrary time position is designated in an
initially selected moving image (A), a new moving image
(B) to be inserted is photographed, and a moving image
(A1+B+A2) obtained by inserting the moving image (B)

10   into the selected moving image (A) is played back and
displayed can be executed by minimum required key
operations without any change operations of the basic
modes. Hence, the operations required for the user of
the digital camera 1 to edit data can be greatly

15   simplified.

           In addition, after the user firmly visually
recognizes a scene immediately after a new moving image
to be inserted, the photographing operation of that
image starts. Therefore, the user can start

20   photographing the moving image to be inserted after he
or she sufficiently recognizes his or her intention,
thus reducing photographing failures.

           Note that the fourth embodiment has explained the
playback process of a moving image for a predetermined

25   period of time in step D10 in combination with the
operation of the first embodiment. However, this
process can be executed in combination with the

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operation of the second or third embodiment in addition
to the first embodiment.

In this case, prior to the beginning of
photographing of a new moving image to be photographed
5   and recorded, a scene immediately before that moving
image is inserted is played back in consideration of
the photographing order, and the user can visually
confirm the contents.

Furthermore, in the first to fourth embodiments,
10   when moving image A' is recorded in the flash memory 38
as the recording medium, the data files of old moving
images A and B are erased from the flash memory 38 at
the same time. Alternatively, the old data files may
not be erased, or the user may select whether or not
15   old moving images A and B are to be erased. When old
moving images A and B are kept intact, the use range of
image data of the user can be broadened.

In the first to fourth embodiments, image data to
be inserted in a moving image is a moving image.
20   However, image data to be inserted is not limited
to a moving image but may be a still image. In this
case, a still image is converted into that for
a predetermined period of time (e.g., 2 seconds) in the
same data format as moving image A, and the converted
25   still image is inserted in the same manner as in the
case wherein moving image B is inserted. Then, the
obtained data is recorded in the flash memory 38 in the

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same manner as moving image A'. Assume that the user

can arbitrarily set the predetermined period of time.

Of course, the user can select whether or not the old

moving image and still image are to be erased. In this

5   way, image edit operations intended by the user can be

made.

In the first to fourth embodiments, the present

invention is applied to the digital camera. However,

the present invention is not limited to this, and may

10   be applied to various other image sensing devices such

as camera-integrated video tape recorders which use

a randomly accessible semiconductor memory, hard disk

device, and the like as recording media, and a portable

phone terminal and PDA (Personal Digital Assistants)

15   which are compatible to moving images, and the like.

The present invention is not limited to the

aforementioned embodiments, and various modifications

may be made without departing from the scope of the

invention when it is practiced.

20   Furthermore, the embodiments include inventions at

various stages, and various inventions can be extracted

by appropriately combining a plurality of disclosed

required constituent elements. For example, even when

some required constituent elements are omitted from all

25   required constituent elements described in the

embodiment, an arrangement from which the required

constituent elements are omitted can be extracted as

an invention as long as the problems that have been
discussed in the paragraphs of the problems to be
solved by the invention are solved, and the effects
that have been explained in the paragraphs of the
5   effect of the invention can be obtained.

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C L A I M S

1. An image sensing device comprising:

a recording unit (38) which records moving image data obtained by photographing;

a designation unit (36) which designates an arbitrary time position in the moving image data recorded in the recording unit;

a photographing control unit (32D) which starts photographing of an image on the basis of designation of the time position by the designation unit; and

an insert unit (32E) which inserts image data obtained by photographing by the photographing control unit in the moving image data on the basis of the designated time position, and stores the obtained moving image data.

2. An image sensing device according to claim 1, wherein the designation unit designates a plurality of arbitrary time positions in the moving image data.

3. An image sensing device according to claim 1, wherein the designation unit designates a plurality of arbitrary time positions and a photographing order in the moving image data, and

the photographing control unit starts photographing of a plurality of images in accordance with the photographing order designated by the designation unit.

4. An image sensing device according to claim 1,

wherein the photographing control unit plays back

a moving image for a predetermined period of time

immediately after the designated time position in the

moving image on the basis of designation of the time

5   position by the designation unit, and then starts

photographing of an image.

          5.   An image sensing device according to claim 1,

wherein the insert unit inserts the image data obtained

by photographing by the photographing control unit in

10   the moving image data on the basis of the designated

time position, plays back the obtained moving image

data, and then stores the obtained moving image data.

          6.   An image sensing device according to claim 1,

wherein the image data obtained by photographing by the

15   photographing control unit is either one of moving

image data and still image data.

          7.   An image edit method comprising:

          a designation step of designating an arbitrary

time position in moving image data recorded in a

20   recording medium that records moving image data

obtained by photographing;

          a photographing control step of starting

photographing of an image on the basis of designation

of the time position in the designation step; and

25   an insert step of inserting image data obtained by

photographing in the photographing control step in the

moving image data on the basis of the designated time

position, and storing the obtained moving image data.

8. An image edit method according to claim 7, wherein the designation step includes a step of designating a plurality of arbitrary time positions in the moving image data.

9. An image edit method according to claim 7, wherein the designation step includes a step of designating a plurality of arbitrary time positions and a photographing order in the moving image data, and

the photographing control step includes a step of starting photographing of a plurality of images in accordance with the photographing order designated in the designation step.

10. An image edit method according to claim 7, wherein the photographing control step includes a step of playing back a moving image for a predetermined period of time immediately after the designated time position in the moving image on the basis of designation of the time position in the designation step, and then starting photographing of an image.

11. An image edit method comprising:

a designation step of designating an arbitrary time position in moving image data recorded in a recording medium that records moving image data obtained by photographing;

a photographing control step of starting photographing of a still image on the basis of

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designation of the time position in the designation
step; and

an insert step of inserting still image data
obtained by photographing in the photographing control
step as a still image for a predetermined period of
time in the moving image data on the basis of the
designated time position, and storing the obtained
moving image data.

12. An image edit method according to claim 11,
wherein the designation step includes a step of
designating a plurality of arbitrary time positions in
the moving image data.

13. An image edit method according to claim 11,
wherein the designation step includes a step of
designating a plurality of arbitrary time positions and
a photographing order in the moving image data, and

the photographing control step includes a step of
starting photographing of a plurality of still images
in accordance with the photographing order designated
in the designation step.

14. An image edit method according to claim 11,
wherein the photographing control step includes a step
of playing back a moving image for a predetermined
period of time immediately after the designated time
position in the moving image on the basis of
designation of the time position in the designation
step, and then starting photographing of a still image.

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15.   A storage medium that records an image edit method, comprising:

a designation step of designating an arbitrary time position in moving image data recorded in a recording medium that records moving image data obtained by photographing;

a photographing control step of starting photographing of an image on the basis of designation of the time position in the designation step; and

an insert step of inserting image data obtained by photographing in the photographing control step in the moving image data on the basis of the designated time position, and storing the obtained moving image data.

16.   A storage medium that records an image edit method according to claim 15, wherein the designation step includes a step of designating a plurality of arbitrary time positions in the moving image data.

17.   A storage medium that records an image edit method according to claim 15, wherein the designation step includes a step of designating a plurality of arbitrary time positions and a photographing order in the moving image data, and

the photographing control step includes a step of starting photographing of a plurality of images in accordance with the photographing order designated in the designation step.

18.   A storage medium that records an image edit

method according to claim 15, wherein the photographing
control step includes a step of playing back a moving
image for a predetermined period of time immediately
after the designated time position in the moving image
5   on the basis of designation of the time position in the
designation step, and then starting photographing of an
image.

FIG.1A

1

8

9

6

4

7

5

2

3

FIG.1B

1

14

15

9

8

16

P R

10

MENU

12

11

13

FIG.2

FIG.3

PLAY MODE

A01 — SELECT MOVING IMAGE (A)

A02 — PLAYBACK START? — NO

A03 — MOVING IMAGE INSERT MODE SET? — NO

YES → A04 — SET MOVING IMAGE INSERT MODE

A02 YES

A05 — MOVING IMAGE INSERT MODE SET? — NO → NORMAL MOVING IMAGE PLAYBACK PROCESS

YES

A06 — PLAY BACK MOVING IMAGE (A)

A07 — INSERT MARK GIVEN? — NO

A08 — END OF PLAYBACK? — NO

YES

A09 — SET RECORD MODE

A10 — START OF MOVING IMAGE RECORDING? — NO

YES

A11 — RECORD MOVING IMAGE (B)

A12 — END OF MOVING IMAGE RECORDING? — NO

YES

A13 — SET PLAY MODE

A14 — PLAY BACK MOVING IMAGE (A1→B→A2)

A15 — SAVE AS NEW FILE? — NO

YES

A16 — CREATE AND SAVE NEW FILE IN PLAYBACK ORDER

A17 — DELETE MOVING IMAGE (B)

END

MOVING IMAGE A

FIG.4A

MOVING IMAGE A

IM

FIG.4B

(A1)   (A2)

MOVING IMAGE B

FIG.4C

MOVING IMAGE A1+B+A2

FIG.4D

(A1)   (B)   (A2)

MOVING IMAGE A'

FIG.4E

FIG.5

MOVING IMAGE A

FIG.6A

MOVING IMAGE A

IM1   IM2   IM3

FIG.6B

(A1)   (A2)   (A3)   (A4)

MOVING IMAGE B

FIG.6C

MOVING IMAGE C

FIG.6D

MOVING IMAGE D

FIG.6E

MOVING IMAGE A1+B+A2+C+A3+D+A4

FIG.6F

(A1)   (B)   (A2)   (C)   (A3)   (D) (A4)

MOVING IMAGE A'

FIG.6G

FIG.7

```
                    ( PLAY MODE )
                          │
  C01                     ▼
  ┌──────────────────────────────┐          ┌────────────────────────────┐
  │    SELECT MOVING IMAGE        │          │        MOVING           C03 │ YES
  └──────────────────────────────┘          │   IMAGE INSERT MODE   ◇─────────┐
  C02                     │                  │      DESIGNATED?           │     │
         ◇────────────────────────◇  NO      └────────────────────────────┘     │
         PLAYBACK START?  ─────────►              │ NO           C04            │
         ◇────────────────────────◇          ┌────────────────────────────┐     │
                          │ YES                │  SET MOVING IMAGE          │◄────┘
  C05                     ▼                    │  INSERT MODE               │
         ◇────────────────────────◇  NO       └────────────────────────────┘
         MOVING IMAGE              ─────┐               │
         INSERT MODE                    │               │
         SET?                    ┌──────────────┐        │
         ◇──────────────◇        │ NORMAL MOVING │        │
                │ YES            │ IMAGE PLAYBACK│        │
  C06           ▼                │  PROCESS      │   C08  ▼
  ┌──────────────────────────┐   └──────────────┘   ◇──────────────────────◇ NO
  │   PLAY BACK               │◄──────┘              INSERT MARK         ─────────┐
  │   MOVING IMAGE (A)        │                      GIVEN?                       │
  └──────────────────────────┘                      ◇──────────────────────◇     │
  C07           │                                   YES │       C10              │
         ◇──────────────────◇ NO                   ┌────────────────────────┐    │
         END OF          ─────────────────┐         │ SET GIVEN INSERT MARK  │    │
         PLAYBACK?                          │        └────────────────────────┘    │
         ◇──────────────────◇              │              │       C11             │
                │ YES                       │        ┌────────────────────────┐    │
  ┌─────────────┼───────────────────┐       │        │ SET PHOTOGRAPHING      │    │
  │ C12         ▼                    │       │        │ ORDER                  │    │
  │      ◇────────────────────◇ NO   │       │        └────────────────────────┘    │
  │      MOVING IMAGE      ───────┐  │       │   YES          │       C09          │
  │      TO BE INSERTED?          │  │       │  ◇────────────────────────────────◇ NO
  │      ◇────────────────◇       │  │       └──END OF                          ──┘
  │ C13         │ YES             │  │          INSERT MARK GIVING
  │  ┌───────────────────────┐    │  │          OPERATION?
  │  │ SET RECORD MODE        │    │  │          ◇────────────────────────────────◇
  │ C14         │              │  │                   │            C19
  │  ┌───────────────────────┐    │  │          ┌────────────────────────┐
  │  │ DESIGNATE HEAD OF     │    │  │          │  SET PLAY MODE         │
  │  │ PHOTOGRAPHING ORDER   │    │  │          └────────────────────────┘
  │  └───────────────────────┘    │  │                   │            C20
  │ C15         ▼              │  │          ┌────────────────────────┐
  │      ◇────────────────────◇   │  │          │ PLAY BACK MOVING       │
  │      START OF           NO │  │          │ IMAGE (FORMED BY        │
  │      MOVING IMAGE   ───────┘  │          │ INSERTING IMAGE B AND   │
  │      RECORDING?               │          │ SUBSEQUENT IMAGES IN A  │
  │      ◇────────────────◇       │          │ IN DESIGNATED ORDER)    │
  │ C16         │ YES             │          └────────────────────────┘
  │  ┌───────────────────────┐    │                   │            C21
  │  │ RECORD MOVING IMAGES  │    │          ◇────────────────────────◇ NO
  │  │ (IMAGE B AND          │    │          SAVE AS NEW FILE?   ──────────┐
  │  │ SUBSEQUENT IMAGES)    │    │          ◇────────────────────────◇     │
  │  └───────────────────────┘    │                   │ YES     C22        │
  │ C17         │                 │          ┌────────────────────────┐     │
  │      ◇────────────────────◇ NO│          │ CREATE AND SAVE NEW    │     │
  │      END OF          ─────────┘          │ FILE IN PLAYBACK ORDER │     │
  │      MOVING IMAGE             │          └────────────────────────┘     │
  │      RECORDING?               │                   │            C23       │
  │      ◇────────────────◇       │          ┌────────────────────────┐     │
  │ C18         │ YES             │          │ DELETE MOVING IMAGES   │◄────┘
  │  ┌───────────────────────┐    │          │ (IMAGE B AND           │
  │  │ CHECK RECORDED         │    │          │ SUBSEQUENT IMAGES)     │
  │  │ MOVING IMAGE           │    │          └────────────────────────┘
  │  └───────────────────────┘    │                   │
  └───────────────────────────────┘              ( END )
```

MOVING IMAGE A

FIG.8A

IM1 (PHOTOGRAPHING ORDER: 2)   IM2 (PHOTOGRAPHING ORDER: 3)

MOVING IMAGE A   IM3 (PHOTOGRAPHING ORDER: 1)

FIG.8B

(A1)   (A2)   (A3)   (A4)

MOVING IMAGE B

FIG.8C

MOVING IMAGE C

FIG.8D

MOVING IMAGE D

FIG.8E

MOVING IMAGE A1+C+A2+D+A3+B+A4

FIG.8F

(A1)   (C)   (A2)   (D)   (A3)   (B)   (A4)

MOVING IMAGE A'

FIG.8G

FIG.9

(PLAY MODE)

D01 — SELECT MOVING IMAGE

D02 — PLAYBACK START? — NO

D03 — MOVING IMAGE INSERT MODE SET? — NO

YES ↓ D04

SET MOVING IMAGE INSERT MODE

YES ↓

D05 — MOVING IMAGE INSERT MODE SET? — NO

NORMAL MOVING IMAGE PLAYBACK PROCESS

YES ↓

D06 — PLAY BACK MOVING IMAGE (A)

D07 — INSERT MARK GIVEN? — NO

D08 — END OF PLAYBACK? — NO

YES

D09 — SET RECORD MODE

D10 — PLAY BACK SCENE IMMEDIATELY BEFORE INSERT MARK FOR PREDETERMINED PERIOD OF TIME

D14 — SET PLAY MODE

D15 — PLAY BACK MOVING IMAGE (A1→B→A2)

D16 — SAVE AS NEW FILE? — NO

D11 — START OF MOVING IMAGE RECORDING? — NO

YES ↓ D17

CREATE AND SAVE NEW FILE IN PLAYBACK ORDER

D12 — RECORD MOVING IMAGE (B)

D18 — DELETE MOVING IMAGE (B)

D13 — END OF MOVING IMAGE RECORDING? — NO

(END)

YES

FIG.10

BAR1   M   BAR

FIG.11

"PRESS SHUTTER TO START PHOTOGRAPHING
MOVING IMAGE TO BE INSERTED"

International Application No PCT/JP 03/15111

INTERNATIONAL SEARCH REPORT
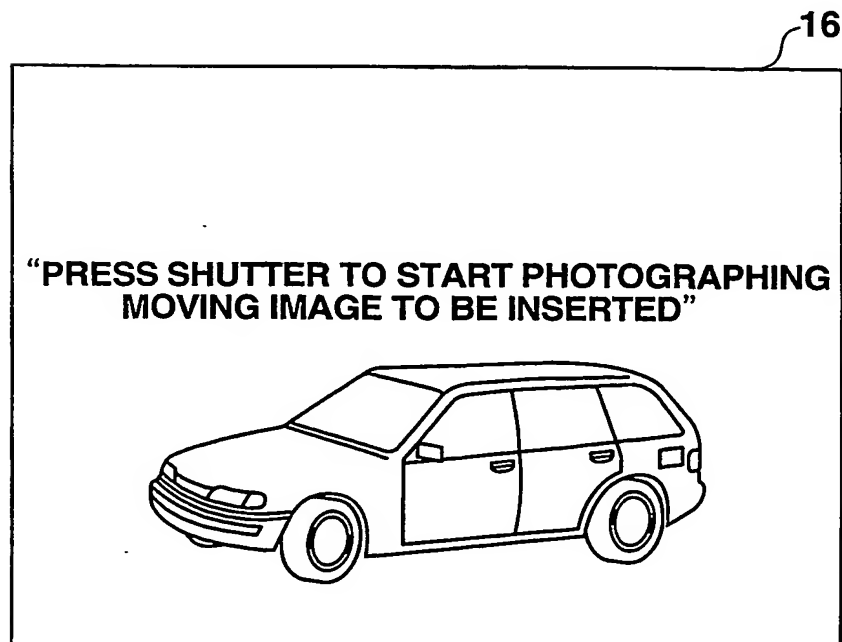
International Application No

PCT/JP 03/15111

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7   G11B27/036

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7   G11B   H04N   G06K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2001/026644 A1 (ENDO YOSHIYUKI ET AL) 4 October 2001 (2001-10-04) abstract figures 3-5,10 paragraph '0004! paragraphs '0012! - '0018! paragraphs '0026! - '0029! paragraphs '0074! - '0095! -----	1-18
A	PATENT ABSTRACTS OF JAPAN vol. 2000, no. 01, 31 January 2000 (2000-01-31) & JP 11 275512 A (SANYO ELECTRIC CO LTD), 8 October 1999 (1999-10-08) cited in the application abstract ----- -/--	1-18

| X | Further documents are listed in the continuation of box C. | | X | Patent family members are listed in annex. |

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"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
25 May 2004	02/06/2004

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax (+31–70) 340–3016	Valencia, E

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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